NEOTROPICAL ORNITHOLOGY: RECKONING WITH HISTORICAL ASSUMPTIONS, REMOVING SYSTEMIC BARRIERS, AND REIMAGINING THE FUTURE

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ABSTRACT

A major barrier to advancing ornithology is the systemic exclusion of professionals from the Global South. A recent special dossier, *Advances in Neotropical Ornithology*, and a shortfalls

analysis therein, unintentionally followed a long-standing pattern of highlighting individuals, knowledge, and views from the Global North, while largely omitting the perspectives of people based within the Neotropics. Here, we review problems with assessing the state of Neotropical ornithology through a northern lens, including discovery narratives, incomplete (and biased) understanding of history and advances, and the promotion of agendas that, while currently popular in the north, may not fit the needs and realities of Neotropical research. We argue that future advances in Neotropical ornithology will critically depend on identifying and addressing the systemic barriers that hold back ornithologists who live and work in the Neotropics: unreliable and limited funding, exclusion from international research leadership, restricted dissemination of knowledge (e.g., through language hegemony and citation bias), and logistical barriers. Moving forward, we must examine and acknowledge the colonial roots of our discipline, and explicitly promote anticolonial research, training, and conservation agendas. We invite our colleagues within and beyond the Neotropics to join us in creating a new model of governance that establishes research priorities with vigorous participation of ornithologists and other stakeholders within the Neotropical region. To include a diversity of perspectives, we must systemically address discrimination and bias rooted in the socioeconomic class system, anti-Blackness, anti-Brownness, anti-Indigeneity, misogyny, homophobia, tokenism, and ableism. Instead of seeking individual excellence and rewarding top-down leadership, institutions in the North and South can promote collective leadership. Authentic collaborations should value the perspectives of those directly involved and affected by policies. In adopting these approaches, we, ornithologists, will join a community of researchers across academia building new paradigms that can reconcile our relationships and transform science.

Keywords: discovery narrative, discrimination, knowledge construction, North-South relations, parachute science, regional priorities, research agenda

ORNITOLOGÍA NEOTROPICAL: RECONSIDERANDO SUPUESTOS HISTÓRICOS, ELIMINANDO BARRERAS SISTÉMICAS Y REIMAGINANDO EL FUTURO

Resumen

Una barrera importante para el avance de la ornitología sigue siendo la exclusión sistémica de los profesionales del Sur Global. Una colección especial de artículos publicada recientemente, *Advances in Neotropical Ornithology*, incluye un análisis de deficiencias que involuntariamente sigue un largo patrón de destacar a las personas, el conocimiento y las opiniones de los EEUU y Europa (Norte Global) mientras que omite en gran medida las perspectivas de personas basadas en el Neotrópico. Aquí revisamos algunos de los problemas que surgen cuando se evalúa el estado de la ornitología neotropical a través de una visión del norte, incluida la propagación de narrativas de descubrimiento, una imagen incompleta (y sesgada) de su historia y avances, y la promoción de preguntas, herramientas y enfoques que, si bien son populares actualmente en el norte, no necesariamente encajan en la agenda y realidades de la investigación neotropical. Argumentamos que los avances futuros en la ornitología neotropical dependerán críticamente de identificar y abordar las deficiencias sistémicas que frenan a los ornitólogos que viven y trabajan en el Neotrópico: financiamiento limitado y poco confiable, exclusión del liderazgo de investigación internacional, difusión restringida del conocimiento (por ejemplo, a través de la hegemonía del idioma y el sesgo de citación) y barreras logísticas. En el futuro, debemos examinar y reconocer las raíces coloniales de nuestra disciplina y promover agendas de investigación, capacitación

y conservación que sean explícitamente anticoloniales. Invitamos a nuestros colegas dentro y fuera del Neotrópico a unirse a nosotros en la creación de un nuevo modelo de gobernanza que establezca prioridades de investigación con una participación vigorosa de ornitólogos y otras partes interesadas de la región neotropical. Para incluir una diversidad de perspectivas, debemos abordar sistémicamente la discriminación y el sesgo arraigados en el sistema de clases socioeconómicas, el racismo anti-negro, anti-mestizo y anti-indígena, la misoginia, la homofobia, la inclusión simbólica y el capacitismo. En lugar de buscar la excelencia individual y recompensar el liderazgo de arriba hacia abajo, las instituciones del Norte y del Sur pueden promover el liderazgo colectivo. Las colaboraciones auténticas deben valorar las perspectivas de quienes están directamente involucrados y afectados por sus políticas. Al adoptar estos enfoques, los ornitólogos nos uniremos a una comunidad de investigadores de toda la academia en la construcción de nuevos paradigmas que reconcilien nuestras relaciones y transformen la ciencia.

Palabras clave: agenda de investigación, ciencia neocolonial, construcción del conocimiento, discriminación, narrativa de descubrimiento, prioridades regionales, relaciones Norte-Sur

Lay Summary

- Research conducted by ornithologists living and working in Latin America and the Caribbean has been historically and systemically excluded, leading to under-representation in global scientific paradigms and organizational leadership, and ultimately holding back ornithology as a discipline
- To avoid replicating the *status quo* for Neotropical ornithology, authors, editors, reviewers, journals, scientific societies, and research institutions need to challenge

historical narratives and center the leadership of ornithologists from under-represented groups

- To advance Neotropical ornithology and conserve birds across the Americas, institutions should invest directly in natural history and field ecology research and reward collective leadership that includes the people affected by research policies

INTRODUCTION

Roughly a third of all bird species occur in the Neotropics (Mexico, Central and South America, and the Caribbean; Newton 2003), yet these birds are under-represented by an order of magnitude in scientific studies (Ducatez and Lefebvre 2014), leading many to call for increased research in Neotropical ornithology (Estades 2002, Freile et al. 2006, Alves et al. 2008, Freile and Córdoba 2008, Latta 2012, Freile et al. 2014). These calls were recently reiterated in a Special Feature entitled *Advances in Neotropical Ornithology*, published in *The Auk: Ornithological Advances* and *The Condor: Ornithological Applications* (Lindell and Huyvaert 2020), which included a roadmap for identifying and filling shortfalls in Neotropical ornithology (Lees et al. 2020). The framework for this roadmap was the idea that biological knowledge shortfalls, grouped in seven domains (systematics, biogeography, population biology, evolution, functional ecology, abiotic tolerance, and biotic interactions) limit large-scale comprehension of biodiversity (Hortal et al. 2015). However, knowledge—and knowledge gaps—look different depending on where we are standing, our lived experiences, and what we perceive to be our objectives. To advance ornithology, it is important to look beyond research gaps and consider the effects of our assumptions and practices (as researchers, ornithological societies, and academic institutions). In this way, we can remedy our policies and try out new paradigms for the construction of knowledge (Naranjo et al. 1992).

The roadmap by Lees et al. (2020) aimed to “take stock of the last 25 years of Neotropical ornithological work since the untimely death of Ted Parker” (Lees et al. 2020: 1). It was initially invited as the first chapter of a (second) special volume honoring Ted A. Parker III, which, like the special volume of *Ornithological Monographs* edited by Remsen (1997), would pay homage to Parker’s legacy (A. Lees *in litt*. 2020). Parker was a field ornithologist from the USA, who specialized in the Neotropics and died tragically in a plane crash while conducting fieldwork in 1993 (Remsen 1997). The contributions of Parker and his colleagues sparked important lines of research and conservation in the Neotropics, and some of our own work builds on, and cites, their publications (e.g., González-García 1994, 1995; Bonaccorso 2009, Mata et al. 2009, Areta and Cockle 2012, Ruelas Inzunza et al. 2012, Borges et al. 2019, Martínez-Medina et al. 2021).

While admiring Parker's work and understanding the context of the invited contribution by Lees et al. (2020), we think it is problematic to build a future roadmap for Neotropical ornithol-ogy based primarily on a foreign historical perspective. For instance, the review by Lees et al. (2020) cites literature from only three of the many ornithological journals based in the Neotrop-ics (Table 1). It focuses quite extensively on the contributions of foreign scientists (including quotes and photos), which creates the unfortunate impression that Neotropical ornithology ad-vances primarily in response to a northern research agenda, led by short-term visitors who con-duct fieldwork in the region, but produce, analyze, and disseminate knowledge elsewhere (e.g., see Monge-Nájera 2002, Haelewaters et al. 2021, Asase et al. 2021, Adame in press). Several of the authors of the Lees et al. (2020) roadmap collaborate extensively with ornithologists based in the Neotropics, and our critique is not aimed at these authors or their research. Rather, the Lees et al. (2020) paper ignited our critique, which is not remedial but systemic. We intend to illustrate how, as researchers, we almost inevitably reproduce biased narratives and propose future paths that primarily serve established interests, unless we make intentional efforts to include under-represented voices and actively question historical narratives about our discipline.

The Neotropical region stretches from central Mexico to the southern tip of South America (Sclater 1858). It encompasses biomes from tropical to sub-polar, with more than 40 countries and political units, and a human population comparable to that of Europe with twice its area. Although frequently imagined, from outside, as a rather homogenous monolith, the Neotropical region is a complex mosaic, culturally, linguistically, socially, racially, and economically. Yet, of the 10 papers published in the Special Feature *Advances in Neotropical Ornithology*, only three included authors affiliated with a Neotropical institution, and only one of them was listed as first author. In fact, 77% of the contributors to the special feature, and all six contributors to the Lees et al. (2020) roadmap, were primarily affiliated at institutions in countries of the "Global North" (USA, Europe, and Canada; Supplementary Table S1). While foreign-based scientists unquestionably contribute to the development of Neotropical ornithology, this series of reviews written mostly by US and European authors follows a common yet problematic pattern in Neotropical biology. This pattern has deep roots in the scientific colonialism of the 19th and 20th centuries and its legacy of systemic exclusion of the Caribbean and Latin American scientific communities (Raby 2017a,b, Mohammed et al. in press). Today, it is still common for high-impact global reviews, and research articles focused on the Neotropics (and other under-represented regions, such as Africa; e.g., Beale 2018), to neglect (intentionally or not) regional contributions, perspectives, and goals, often overlooking important developments and key barriers to further advancement (Cusicanqui 2012, McKechnie and Amar 2018, Asase et al. 2021, de Gracia 2021, Trisos et al. 2021, Adame in press).

As people who contribute to Neotropical ornithology, mostly based at institutions in the Neotropics, we share a responsibility for how ornithology is conceived and practiced in our biologically and culturally diverse region. Here, we review the strengths and challenges of Neotropical ornithology in a global context, contrast our assessment with prevailing views expressed or implied in the roadmap by Lees et al. (2020), and propose systemic changes to reduce inequalities and advance Neotropical ornithology. We do not represent all Neotropical ornithologists, and we recognize that our authorship remains biased (e.g., 58% cis men; 39% white or ethnically European; 96% able-bodied; 64% based in Argentina, Mexico, or Brazil). However, we made intentional efforts and took extra time to ensure that we included and highlighted voices from a breadth of regions, races, ethnicities, gender identities, disciplines, career paths, and stages (Supplementary Table S2). We posit that effective strategies to further develop Neotropical ornithology require a critical review of research practices and perspectives that have long been taken for granted.

STRENGTHS AND CHALLENGES OF NEOTROPICAL ORNITHOLOGY TODAY

Ornithology in Latin America and the Caribbean is underpinned by regional institutions, academic research, conservation programs, and a rapidly growing cadre of ornithologists. The strength of Neotropical ornithology lies in the collective work of students, professionals, and non-academics based in this region, who creatively propel the discipline despite numerous challenges. Today, ornithological research in the Neotropics is made possible by a combination of locally driven and government-funded research, scientific societies, universities, scientific collections, non-governmental organizations, citizen-science projects, international collaborations, and highly significant contributions from independent naturalists, birding clubs, tour guides, local and Indigenous communities, and park rangers. Beyond the USA-backed programs and research stations most visible to researchers in the Global North, many well-established Latin American and Caribbean groups are powerhouses of research focused on Neotropical birds, with long-term programs in the Caribbean, Mesoamerica, the Andes, the sub-Antarctic region, the Amazon basin, and the Atlantic Forest, to name a few (Table 2). Regional strengths extend to the fields of avian paleontology, ethno-ornithology, and behavior, mostly overlooked by Lees et al. (2020), but crucial for filling gaps in knowledge about the systematics, evolution, biogeography, mutualistic interactions, abiotic tolerance, and natural history of Neotropical birds (e.g., Cohn-Haft et al. 1997, Tambussi and Degrange 2013, Ornelas et al. 2013, Navarro-Sigüenza et al. 2014, Vizentin-Bugoni et al. 2014, Ibarra and Pizarro 2016, Reboreda et al. 2019).

Many Neotropical countries fund graduate programs with faculty, research scientists, and masters and doctoral students contributing to the construction of regional ornithological knowledge (Paynter 1991, Alves et al. 2008, Freile et al. 2014). In some countries, notably Argentina, Mexico, and Brazil, public universities offer free undergraduate and graduate training to students across the region. Furthermore, many undergraduate programs require theses, which can result in publications in regional journals. In several countries, ornithological research is federally funded, with agencies providing employment, fellowships, and grants for research and graduate studies (e.g., CONICET in Argentina, CONACYT in Mexico, ANID in Chile, MINCIENCIAS in Colombia, CNPq and CAPES in Brazil). The wealth of regionally produced knowledge in Neotropical ornithology has been increasingly accessible, largely resulting from the growth of our professional societies since the 1980s (e.g., Neotropical Ornithological Society, the Brazilian Society of Ornithology, Society of Avian Paleontology and Evolution, Sociedad para el Estudio y Conservación de las Aves de México A.C. [CIPAMEX], and BirdsCaribbean). Many of these societies regularly organize professional meetings (e.g., Congreso de Ornitología Neotropical, Congreso para el Estudio y Conservación de las Aves en México, BirdsCaribbean meetings) and publish peer-reviewed scientific journals in Spanish, Portuguese, and English (Table 1). These journals are the main outlets for publications on natural history and bird distributions in the region and have contributed greatly to advancing knowledge of avian ecology (Vuilleumier 2003, Levy 2008, Freile et al. 2014, Devenish-Nelson et al. 2017, Bugoni 2020). At least 21 regional journals focus on Neotropical ornithology; most of them are both Open Access to readers and free to authors (Table 1), and the oldest, *El Hornero*, dates to 1917 (López de Casenave 2017).

Despite these regional strengths, one of the most pervasive shortfalls in Neotropical ornithology is the exclusion of Neotropical ornithologists, and their research, from the global scientific context (Valenzuela-Toro and Viglino 2021, Khelifa and Mahdjoub 2022; Table 3). Within and beyond the Neotropics, the current academic system rewards fast-paced science that reinforces existing inequalities and racial disparities, disfavoring underrepresented groups (Leite and Diele-Viegas 2021). For a variety of reasons we discuss below, Neotropical researchers often ask different kinds of questions; use different study designs, sampling protocols, and tools; and disseminate our research at a different pace and in different outlets than colleagues who work at institutions in the Global North. In the face of chronic and severe funding scarcity, we may prioritize our insufficient funds for training students and involving local communities (vs. purchasing imported technology). Often, we study little-known, threatened species or ecosystems under very challenging field conditions, and need to gather basic information on the species or study system from scratch as a first step to longer-term research programs. In such a context, the growing prioritization of narrow hypothesis-driven questions over descriptive studies might not be the best way to move knowledge forward or address regional priorities for bird conservation. Nevertheless, our contributions to ornithology are overwhelmingly assessed using whatever standards and values are current in the Global North. In this context, most researchers must "publish or perish" while trying our best to balance local research, teaching, and conservation needs.

While researchers from the Global North often conduct short-term projects in so-called 'developing countries,' they have little incentive to invest the time and energy needed for meaningful long-term collaborations that address the research questions of local ornithologists. Over decades, this paradigm of "helicopter" or "parachute science" has resulted in many papers in high impact journals, by a majority of foreign authors, but it can slow or obstruct the growth of local research capacity in the Global South (Asase et al. 2021). It is not surprising, then, that ornithologists based in Latin America and the Caribbean—particularly those who are historically, systemically, and persistently excluded from science because of marginalized identities (e.g., Black, Brown, and Indigenous women)—are under-represented internationally in research networks, publications, professional societies, editorial bodies of ornithological publications, priority-setting groups of funders, taxonomic authorities, awards, and citations.

Editors and reviewers play a critical and under-examined gatekeeping role that often restricts the access of Neotropical ornithologists to publishing in top journals. First, reviewers rarely ask scholars from Europe or the USA to translate, learn, or cite theory and case studies from Latin America or Africa, but they routinely expect scholars from the Global South to do the opposite (Cusicanqui 2012, Monjeau et al. 2013, Rau et al. 2017, Pérez and Radi 2019). Whereas studies from Europe or North America are interpreted as being globally representative (de Gracia 2021), manuscripts from the Neotropics are often rejected without review as "too locally focused". We end up examining Neotropical research problems through theoretical frameworks developed for temperate zone questions.

Second, modern science is, in Gordin's (2015: 2) words, "the most resolutely monoglot international community," but few people in Latin America and the Caribbean are native speakers of English, and in most countries only a privileged minority can afford to learn English as a second language (e.g., about 5% of the population of Bolivia, Brazil or Ecuador, vs. 38% of the European Union; European Commission 2006, British Council 2015, Sevy-Biloon et al. 2020). Many journals (including *Ornithology* and *Ornithological Applications*) explicitly ask authors whose primary language is not English to have their work edited by an English-speaking colleague or professional editing service (Instructions for Authors: *Ornithology* and *Ornithological Applications*, 21 December 2021). However, English-speaking colleagues are rarely available for free editing of manuscripts, and professional editing services cost ~US$600 for a 6000-word manuscript—more than a month's salary for many scientists in Latin America and the Caribbean. Disseminating and integrating the knowledge generated by non-English speakers is a justice issue critical to both the inclusiveness and the quality of science (e.g., Ramírez-Castañeda 2020, Amano et al. 2021). Non-English journals are critical to disseminating ornithological research by, and to, groups under-represented in science. However, global reviews frequently overlook (and therefore undermine) research that is not in English, which lowers the impact factor of journals in local languages, and pushes Latin American students and researchers to try to publish in English when possible (Di Bitetti and Ferreras 2017, Konno et al. 2020). Even researchers based in the Neotropics may often prioritize citing work in English, led by scientists from wealthier regions, in an attempt to increase the chances their manuscripts will be accepted in high-impact journals (Meneghini et al. 2008). In short, current systems in academia (within and beyond the Neotropics) allow and even encourage ornithologists to overlook research contributions of colleagues based in the Neotropics (Table 3), an ongoing, systemic exclusion that extends well beyond ornithology (Gibbs 1995, Campos-Arceiz et al. 2018, Minasny et al. 2020, Nuñez et al. 2021). An extension of this trend to other bird-related endeavors is the widespread practice of birdwatchers and birding guides in Latin America and the Caribbean of routinely using English common names for birds—a habit that helps when guiding English-speaking groups, but also a powerful sign of cultural assimilation and a communication barrier when dealing with people whose first language is not English (Rozzi 2013, Cantú et al. 2020).

CONTRASTING PERSPECTIVES ON NEOTROPICAL ORNITHOLOGY

The Problem of Discovery Narratives

Short-term expeditionists from Europe and the USA contributed to the development of ornithology in the Neotropics, particularly in taxonomy and systematics (e.g., Alexander Wetmore, Frank Chapman, and Storrs Olson; Freile and Córdoba 2008, Levy 2008, Hume 2021). However, to access research sites, expeditionists frequently aligned themselves with imperial or commercial interests (such as territorial acquisition and resource extraction; Naranjo 2008, Raby 2017a). Their research practices generally followed the same unequal exchange model as the economy: foreign companies exported raw materials northward, to be returned to Latin America as finished products; foreign researchers exported bird specimens northward, where they served to formulate theories that were sent back to Latin America for 'consumption' (Quintero 2011). The more significant, long-term contributions to Neotropical ornithology came from people (whether local- or foreign-born) who lived in the Neotropics and invested in local capacity, often by founding schools, ornithological collections, or long-term research programs (e.g., Juan Gundlach in Cuba; Humberto Álvarez López, Gustavo Kattan, and Gary Stiles in Colombia; William H. Phelps, William H. Phelps Jr., and Adolfo Pons in Venezuela; Helmut Sick, Emilie Snethlage, William Belton, and Fernando Novaes in Brazil; Miguel Lillo, Roberto Dabbene, Claes Christian Olrog, and Eduardo Tonni in Argentina; Maria Koepcke in Peru; Allan R. Phillips, Miguel Álvarez del Toro, and Mario A. Ramos in Mexico; and Daniel González Acuña in Chile, to name just a few; Vuilleumier 1995, Cuarón 1997, Silva et al. 2005, Di Giacomo and Di Giacomo 2008, López Ordóñez et al. 2014, Pizarro et al. 2020, Levy 2008, Junghans 2009, Voss 2009, Gómez et al. 2022). Despite their important contributions to ornithology within the Neotropics, many of these scientists are not well known in the Global North.

Discovery narratives centered on foreign ornithologists are common across scientific disciplines, and they perpetuate the colonialist discourse that phenomena and species remain 'unknown' until they are 'discovered' or named (by the right person). For example, Ted Parker is admired for his 'singular skills of observation' (Lees et al. 2020:10) leading to the description of 10 taxa, and his popularization of vocalizations as a critical tool for surveying birds in tropical forests, at a time (the 1970s) when 'the voices of most Neotropical birds were unknown' (Remsen and Schulenberg 1997:10). What we rarely admit, as ornithologists, is that long before westerners arrived in the Americas, Indigenous Peoples had already identified, named, and cataloged, through oral tradition, thousands of bird vocalizations, often experiencing and identifying birds more by ear than visually (Cebolla Badie 2000, 2013; Berlin 1981, Ibarra and Pizarro 2016, Madroño 2016, Ibarra et al. 2020). For example, Chachugi (2013) explains how the Aché Indigenous language (in the region currently known as Paraguay) includes specific words that represent types of bird sounds associated with specific contexts (e.g., lek, alarm, mixed-species flock) and environmental conditions (e.g., open understory at display arenas). Chachugi and other Aché adults recall how, in their childhood, they were instructed by their grandparents to imitate the vocalizations of a wide diversity of bird species, from the tiny kwi'i (Olivaceous Woodcreeper, *Sittasomus griseicapillus*) to the djaku (Black-fronted Piping-Guan, *Pipile jacutinga*). The Aché people exhibit an extraordinary ability (by the standards of western scientists) to remember and reproduce these sounds, using them as 'playback' to attract and hunt adult birds, and to find nests.

Among western scientists, too, knowledge of bird vocalizations in the Neotropics was and is constructed collectively, and the story is much more complex and interesting than a simple discovery narrative would have us believe. Among scientists, the use of bioacoustics to identify Neotropical birds dates at least to 1831 in Brazil (Toledo and Araujo 2017). Johan Dalgas Frisch released his first record (Cantos das Aves do Brasil) simultaneously in Rio, New York, and London in 1962 (Gorgulho et al. 2005), and Jacques Vielliard recorded and described birds by sound as early as 1974 (e.g., Vielliard 1983). In Venezuela, Paul A. Schwartz recorded around 800 species by the 1970s, nearly 1/4 of all South American birds (Gorton 2010). In Argentina, Roberto Straneck began recording birds in 1964, contributed to the archive of natural audio recordings of the Museo Argentino de Ciencias Naturales and, in 1990, published popular guides to bird sounds of Argentina that were critical to expanding knowledge of bird distributions and abundance in the southern cone (e.g., Straneck 1990; Fernández Balboa 2016). Schwartz, Straneck and Vielliard were locally based and pioneered the use of bioacoustics as a taxonomic tool (Schwartz 1968, 1972; Straneck 1987, 1993, 2007; Straneck and Vidoz 1995, Vielliard 1990).

Although discovery narratives are part of the colonialist scientific legacy we have inherited, we must conceptualize an ornithological future without them. It is worthwhile to question our own roles as authors in perpetuating the idea that phenomena remain 'unknown' until they are popularized in North America and Europe (see Bauer et al. 2018). Breaking our reliance on discovery narratives also means acknowledging the role of colonialism in the ongoing loss of ancestral knowledge and changing our research practices to mitigate researchers' entitlement to Indigenous life and land (Liboiron 2021). In considering the legacy and merit of past and present ornithologists in the Neotropics, we wish to highlight the collective process of building knowledge, taking into account not only research that is of interest to the scientific community of Europe and the USA, but also, critically, contributions that advance local and regional agendas.

The Natural History Gap

Building on the framework of seven biological shortfalls laid out by Hortal et al. (2015), Lees et al. (2020) proposed an eighth "Parkerian Shortfall," a gap in knowledge of natural history. They justified this proposal on the basis of missing information about foraging behavior, diet, nesting, and vocalizations, primarily in English-language resources, especially the Birds of the World platform (https://birdsoftheworld.org). Birds of the World is a highly used and cited online resource maintained by the Cornell Lab of Ornithology and a result of the fusion of the Handbook of the Birds of the World Alive, Birds of North America, Neotropical Birds Online (formerly freely accessible), and other resources. As an example of the natural history gap, Lees et al. (2020) stated that even basic nest descriptions are not listed for 328 of a sample of 1,018 Neotropical species across nine families, in Birds of the World. However, Birds of the World (and other such compilations) are not reliable yardsticks by which to assess recent advances in Neotropical ornithology. In November 2021, we conducted a cursory review of Neotropical species whose nests were described up to 2017, and we found that Birds of the World continued to list

59 of them without nesting information (Table 4). The primary publications arose in online searches and were freely available to download (unlike the species accounts in Birds of the World, which are behind a paywall). According to Fierro-Calderón et al. (2021), in the past 20 years, research teams in Venezuela, Argentina, Brazil, Paraguay, Ecuador, Colombia, and Peru have presented the first descriptions of the nests of over 100 species. We infer that Birds of the World may, at present, omit about half of the modern literature presenting new nest descriptions.

Beyond the species with completely missing nest descriptions, many Neotropical species continue to be listed in Birds of the World with a rudimentary nest description and a statement of 'no further information,' when in fact graduate theses and research papers have addressed other aspects of their reproductive biology, sometimes extensively and with important implications for ecology and evolution (Table 4). Because Birds of the World still omits much of the primary literature produced in the Neotropics over the last two decades, it does not accurately reflect advances in our natural history knowledge since the death of Ted Parker in 1993. Over-reliance on Birds of the World, rather than primary literature, broadens the natural history gap in the Neotropics by systemically undermining the value of research in this field.

We agree with Lees et al. (2020) that there is a real natural history gap in Neotropical ornithology, and we argue that this gap is maintained by a chronic sidelining of natural history and other field research by academic institutions and editorial policies. Lees et al. (2020: 11) urge readers to 'encourage, support, and value both basic science and natural history descriptions of Neotropical birds,' but as people who already encourage, support and value natural history, we are caught in a catch-22. For many of us, natural history is a passion, as well as a critical foundation for our ecological or phylogenetic studies and conservation baselines. However, too often, our results are excluded from publication in global-scope journals (the ones highly valued by our employers), which has a negative impact on our chances of obtaining funding, with the consequent damaging cascade effect on our research and training capacity. When our results are published (e.g., Table 4), they are under-cited. Yet we are asked, by the very institutions that ignore our natural history studies, to generate more natural history data, not for publication in major journals, but for online databases, such as eBird (ebird.org, Cornell Lab of Ornithology) or in 'regional' journals regarded as second-tier outlets for our research. To stop perpetuating the natural history gap, we urge all our colleagues to critically examine and change their research practices. In particular, institutions need to change their policies and investments so as to start valuing natural history and field ecology research in the currency of academia: funding, high-impact journals, and citations.

Tools and Approaches for Neotropical Ornithology

When considering tools and remedial approaches to fill 'gaps' in Neotropical ornithology, it is important to take into account the limitations imposed by global inequalities in access to funding and equipment, and the social implications of technology. For example, in avian parasitology, microscopy is a relatively cheap and data-rich method to identify species, suitable for most regional labs. However, many journal reviewers do not recommend accepting manuscripts based solely on microscopy. Instead, they urge Neotropical researchers to use more expensive techniques (such as Polymerase Chain Reaction amplification of molecular markers), which are often unnecessary to support the results already obtained, and create financial and logistical complications for local researchers. DNA barcoding and Next Generation Sequencing offer powerful tools for understanding our birds, but Neotropical researchers are most often asked to provide samples for international projects, rather than receiving support for their own projects. With few exceptions, these international initiatives rarely respond to our research questions and objectives.

Even relatively simple methods can get complicated in the Neotropics. In Mexico, a country with no national banding system, birds can be banded either using self-made bands or official USGS Bird Band Laboratory bands. These bands and permits are only available for species found in 'North America' (United States and Canada), excluding many tropical, non-migratory species. Master banding permits are only available to US and Canadian nationals and residents. Mexican banders based in Mexico, regardless of their experience, need to take a paid NABCI (North American Bird Conservation Initiative) certification course and band birds as subpermitees of a North American permit holder, imposing both a financial cost and a loss of regional autonomy over the data.

More globally, the growing movement toward open data and author-paid open access publication models will increase power imbalances if we do not directly address inequalities inherent in these systems (e.g. Fontúrbel and Vizentin-Bugoni 2020, Smith et al. 2021). While free access to publications is laudable, most Neotropical researchers cannot afford to pay for open access, which casts authors in the role of clients, rather than creators of knowledge. Likewise, while there are several positive aspects to open data, we need to consider how open data policies might be giving researchers at powerful institutions access to data from Indigenous land and the Global South, without involving or consulting local stakeholders (e.g., Liboiron 2021). In contrast, open software such as R (R Core Team 2021) and QGIS (www.qgis.org), online data-sharing platforms such as xeno-canto (www.xeno-canto.org) and WikiAves (www.wikiaves.com.br), searchable databases such as VertNet (vertnet.org), and online platforms that allow free sharing and access to scientific literature, have revolutionized and democratized our ability to study Neotropical birds. To help bridge existing gaps, we urge colleagues to support these kinds of collective resources that benefit science worldwide.

TOWARD A COLLECTIVELY ENVISIONED ROADMAP FOR NEOTROPICAL ORNITHOLOGY

We present here a consensus view of key elements required to advance Neotropical ornithology (Table 5), noting that a single view is both unrealistic and unnecessary. In fact, one of the most challenging parts of this very article was agreeing on its main content and tone. We need a new model of science governance that establishes research priorities with vigorous participation of ornithologists and other stakeholders from the Neotropical region, respectful of regional worldviews and realities (e.g., as proposed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services; Díaz et al. 2019). We also need a global scientific community that actively works to recognize and remove barriers (e.g., Kraus et al. 2022). In an integrated perspective, we acknowledge that all research is shaped by philosophical foundations and assumptions, and we have much to gain from Indigenous and other non-western approaches, not only with respect to birds but also with respect to leadership, cooperation, kinship, reciprocity, knowledge coexistence and reconciliation, approaches that could transform our field (Levidow 1988, Spiller et al. 2020, Ibarra et al. 2021, Reid et al. 2021). As representatives of our community, ornithological societies and institutions need to publicly recognize and address the colonial legacies of our discipline and the cultural importance of Neotropical birds, and promote local and regional research priorities (Table 5). We encourage programs and policies that promote community-based research and conservation agendas (Rodríguez et al. 2007); prioritize creativity, innovation, and collective leadership (Asai 2020, Care et al. 2021); and explicitly engage in science as a knowledge dialogue (a multiparty interchange or discussion that acknowledges and integrates participants' local and regional needs and outcomes; Anderson et al. 2015).

Substantial gains in knowledge of ornithology require perspectives from the diversity of people living and working within the Neotropics. We will only hear these perspectives if we drastically change academic practices and policies to propel justice, equity, and inclusion in areas such as funding, publishing, capacity building, and collaboration (Ahern-Dodson et al. 2020, Haines et al. 2020, Urbina-Blanco et al. 2020, Trisos et al. 2021, Kraus et al. 2022, Cisneros et al. 2022). We need to systemically address discrimination and bias rooted in the socioeconomic class system, anti-Blackness, anti-Brownness, and anti-Indigeneity, misogyny, homophobia, and ableism. We must acknowledge that access to higher education is unequal in most—if not all—Neotropical countries and take steps to reduce these inequalities (Torres and Schugurensky 2002, McCowan 2007, Cisneros et al. 2022; Table 5). It is imperative that all ornithologists (including those of us born in the Neotropics) reflect on our positionality (our economic and social advantages and disadvantages); make an effort to understand the language, socioeconomic, and political history of the places where we will be working; and ensure deep and meaningful local collaborations (Table 5).

Institutions within and beyond the Neotropics should implement policies and assessment criteria that encourage researchers to step back from top-down leadership positions and encourage them to take roles that support the leadership of local people, including those outside academia. International subsidies of scientific expertise, scholarship funding, and collaborations are welcome, but to be successful they must be viewed as opportunities for scientific exchange among peers, with capacity-building in both directions (Table 5). We encourage institutions and individuals to sustain long-term collaborations that can produce valuable research programs rather than single projects. Critically, we need to challenge the narrative, popular among the leadership of organizations in North America, that our institutions are somehow race- and class-neutral. They are not, and organizational goals for diversity will not be achieved unless we address systemic barriers to participation, funding, and publication (Kraus et al. 2022, Cisneros et al. 2022).

Editors, reviewers, and funding boards should take intentional action to revert the prevailing belief that the role of scholars from the Global South is to produce data or case studies for theorists in the North (Eichhorn et al. 2020). We need to stop judging work from the Neotropics through a northern lens. Journal visions around novelty and impact should specifically remind editors and reviewers of their biases, to prevent articles from being rejected just because a reviewer thinks they are "of regional interest" or of "limited scope" when they are conducted in a study system or on a taxon unfamiliar to the reviewer. Such a policy should also help narrow the natural history gap by encouraging citations of regionally published literature, books, and dissertations published in languages other than English. Journals can reduce inequalities in access to publishing and citation by offering free open access publication in local languages to authors based in the Neotropics. Researchers from the Global North, who are interested in studying Neotropical birds, should make efforts to establish collaborations with ornithologists in the Neotropics, value their work and local knowledge, and visit their museums and other collections, as initial steps (e.g., Areta and Juhant 2018). To reduce helicopter research, ornithological journals could require and publish structured reflexivity statements that describe the ways in which equity was promoted in the partnership that produced the research (e.g., Morton et al. 2022). Journals should expect, and state, that manuscripts on the Global South will include authors from within the region, and that these authors participated actively in the design and interpretation of the research, not simply acquisition of permits and collection of samples; Minasny et al. 2020; see *Conservation Letters* Guidelines for Authorship: https://conbio.onlinelibrary.wiley.com/hub/journal/1755263x/homepage/forauthors.html).

A major step to filling the "Parkerian Shortfall" in natural history knowledge would be for large ornithological societies (such as AOS) to revise their research agendas, redirecting funding and publication opportunities toward natural history, a step that major journals such as Ecology and Biotropica have already taken (Table 5). We need many more grants along the lines of the Skutch and Bergstrom Awards from the Association of Field Ornithologists, which provide critical funding for natural history research by Neotropical ornithologists, and the Vuilleumier Fund, from the Neotropical Ornithological Society, which supports thesis research by students at universities in the Neotropics. However, if we truly want to promote equality in ornithology, such funding should not be restricted to those who can afford to pay for membership in an international society. Moreover, ornithological organizations should remove requirements to implement specific tools or approaches that promote the organization's interests but can undermine local leadership of research and conservation agendas. Organizations within and beyond the Neotropics should ensure that the selection process of funding, awards, and training opportunities prioritizes locally designed projects led by people systemically marginalized or excluded from academic circles (because of race, gender, sexuality, economic limitations, politics, and/or disability; Table 5). Ornithological societies publishing major bird journals should maintain (e.g., Wilson Journal of Ornithology) or can add sections or special issues dedicated to natural history, to increase the visibility of important field observations and the students, researchers, and editors who dedicate time to natural history studies (Ríos-Saldaña et al. 2018, Moore et al. 2020, Powers et al. 2021).

Neotropical governments and institutions have a key role to play in addressing systemic challenges. Our governments need to invest in ornithological research, maintain and develop graduate and research programs, develop performance metrics for our own scientific challenges, and support large-scale and long-term initiatives in the region, based on locally defined research and monitoring objectives. Intentional efforts should be made to support local museums, sound collections, and long-term monitoring programs, such as bird observatories (Franke 2007, Ortega and Hernández 2009, Fontana et al. 2017). Bird observatories, banding, and monitoring programs, such as those that employ constant-effort mist netting and standardized surveys, are important not only for understanding avian habitat relationships and population trends, but also for their contribution to field training of students and wildlife professionals and their important role in the growth of conservation organizations (Latta et al. 2005, Latta and Faaborg 2008). Since 2014, seven projects have been established in Brazil following the model of Bird Observatories, aiming for long-term standardized monitoring; collective efforts are needed to ensure long-term funding of these programs. Urgently, Neotropical institutions need to develop their own criteria for evaluating the importance of research contributions and collaborations, and reduce their reliance on journal impact factors (and other academic metrics), which increasingly reflect foreign priorities and markets.

Beyond research, we also need an explicitly anti-colonial, collaborative, and inclusive approach to conservation. The idea of individual excellence and top-down leadership by a single charismatic leader (usually white and cisgender male) is deeply ingrained in our western value system (Davis 2016), and we rarely question this paradigm. However, as scientists, we are united in increasing knowledge about birds. A culture that encourages us to compete for power within and across teams, and within and across institutions, can often be detrimental to conservation, to future ornithologists, and to our mental health. Instead of starting with preconceived ideas about solutions, authentic collaborations start by gathering everyone's perspective on the topic. For example, for the many species of long-distance migratory birds in steep decline (e.g., Rosenberg et al. 2019), conservation efforts can only succeed if people based in the Neotropics are involved as leaders. Analysis of citizen science and tracking data, by northern researchers, will not be sufficient to understand and reverse stressors on the non-breeding grounds. Moreover, efforts to study and conserve birds across the Americas must also acknowledge and address the majority of rapidly declining species, which spend their entire life cycle within the Neotropics. Promising examples of international networks for research and conservation of Neotropical birds include the Western Hemisphere Shorebird Reserve Network (whsrn.org), Censo Internacional de Aves Acuáticas (Wetlands International), Colombia Resurvey Project (Gomez et al. 2022), Aves Internacionales Network project (Cueto et al. 2015; https://avesinternacionales.wordpress.com) and joint meetings, such as the 2006 North American Ornithological Conference in Veracruz, Mexico, and the 2017 Ornithological Congress of the Americas in Puerto Iguazú, Argentina.

A WAY FORWARD

We began writing this article to channel a collective sense of exasperation with review papers that ignored the knowledge and work of scientists based in the Neotropics. Most of us were trained in a positivist epistemology, at institutions in the Neotropics, North America, or Europe, immersed in a colonial culture that assumes the North leads and the South follows (Monge-Nájera 2002). But, in the words of Simón Rodríguez (1769-1854):

> *La América no debe imitar servilmente, sino ser original. La sabiduría de la Europa y la prosperidad de los Estados Unidos son, en América, dos enemigos de la libertad de pensar* [The Americas must not slavishly imitate, but be original. The wisdom of Europe and the prosperity of the United States are, in the Americas, two enemies of freedom of thought].

In questioning perspectives of Neotropical ornithology, we had to step outside of our research about birds and turn the lens on our own colonial histories and life experience as ornithologists (as modeled 30 years ago by Naranjo et al. 1992, in a symposium on migratory birds). The perspective of Lees et al. (2020) provided an opportunity to reconsider how ornithology is practiced in the Neotropics and to understand commonalities and discrepancies, as a true practice of gathering data to better form an opinion.

Our review represents a few ideas from only a few of the many people studying birds in the Neotropics. As in many other disciplines, the changes required to move ornithology forward are still under construction. To build on our ideas, we urge editors and authors to ensure that future reviews of Neotropical ornithology include perspectives from more people living and working in the Neotropics (Armenteras 2021) as well as thorough and comprehensive reviews of regional literature. Many of us have benefited and continue to benefit from graduate training, positions, and collaborations housed at northern institutions; we have beloved friends and respected colleagues and mentors among researchers in the Global North, including the authors of Lees et al. (2020). We invite these friends and colleagues to join us on the path described so beautifully by Pérez and Radi (2019:982):

...look... past well-known sources, learn... about alien contexts, share... the burden of translation that scholars from the South have carried on their shoulders for centuries, and develop... ethical frameworks for non-exploitative relationships with peers from marginalized contexts...

In making these efforts, we ornithologists will join a community of researchers across academia working to build new paradigms of knowledge construction that can transform our understanding of the world.

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TABLE 1. Latin American and Caribbean peer-reviewed ornithological journals publishing studies on Neotropical birds (in chronological order by date of creation). *Journals cited by Lees et al. (2020). In addition to these journals, dozens of other regional zoology, ecology, biodiversity, veterinary, paleontology, ethnobiology, and natural history journals regularly publish papers in ornithology. Access: Open Access = all articles freely available to readers, Paywalled = access restricted (e.g., to members, libraries, paying customers), Hybrid indicates a mix of Open Access and Paywalled articles. Cost to authors indicates whether authors must pay article processing charges (APC) or page charges to publish. [1]Formerly, Boletín Chileno de Ornitología. [2]Discontinued in 2020. [3]Formerly, El Pitirre. [4]Formerly, Revista Brasileira de Ornitologia and Ararajuba. This tables does not include non peer-reviewed journals that are specialized in birds, such as Achará: Revista de Estudio y Observación de Aves (published by Aves Uruguay), Boletim da Sociedade Brasileira de Ornitologia (Sociedade Brasileira de Ornitologia), El Bien-te-veo (Sociedad Ornitológica Puertorriqueña), or Spizaetus Boletín (Red de Rapaces Neotropicales).

Journal	**Published by**	**Year 1st issue**	**Languages**	**Access**	**Cost to authors (US$)**
El Hornero	Aves Argentinas / Asociación Ornitológica del Plata	1917	Spanish, English	Open Access	Free

Nuestras Aves	Aves Argentinas / Asociación Ornitológica del Plata	1962	Spanish, Portuguese	Open Access	Free
Revista Chilena de Ornitología[1]	Unión de Ornitólogos de Chile (UNORCH)	1969	Spanish, English	Open Access	Free
Atualidades Ornitológicas[2]	Pedro Salviano Filho	1984	Portuguese, Spanish, English, French, Italian	Open Access	Free
Journal of Caribbean Ornithology[3]	BirdsCaribbean	1988	English, Spanish, French	Open Access	Free
Boletín de la Sociedad Antioqueña de Ornitología	Sociedad Antioqueña de Ornitología	1990	Spanish, English	Open Access	Free
Ornitología Neotropical*	Neotropical Ornithological Society	1990	English, Spanish, Portuguese	Open Access	Beyond 10 pages, $50 per page

Ornithology Research[4]*	Sociedade Brasileira de Ornitologia	1990	English (Portuguese and Spanish until 2016)	Hybrid	Free ($2780 for open access)
Cotinga	Neotropical Bird Club (NBC)	1994	English, Spanish, Portuguese	Hybrid	Free
Zeledonia	Asociación Ornitológica de Costa Rica (AOCR)	1997	Spanish, English	Members only	Free
Huitzil, Revista Mexicana de Ornitología	Sociedad para el Estudio y Conservación de las Aves en México A.C. (CIPAMEX)	2001	Spanish, English	Open Access	Free
Ornitología Colombiana	Asociación Colombiana de Ornitología	2003	Spanish, English	Open Access	~$2.00 per page
Ornithologia[2]*	Centro Nacional de Pesquisas e Conservação de Aves Silvestres (CEMAVE), Brazil	2005	Portuguese, Spanish, English	Open Access	Free

La Chiricoca	Red de Observadores de Aves y Vida Silvestre de Chile (ROC)	2006	Spanish	Open Access	Free
Boletín de la Unión de Ornitólogos del Perú	Unión de Ornitólogos del Perú	2006	Spanish, English	Open Access	Free
Revista Venezolana de Ornitología	Unión Venezolana de Ornitólogos	2011	Spanish, English	Open Access	Free
Revista Ecuatoriana de Ornitología	Red Aves Ecuador	2017	Spanish, English	Open Access	Free
Boletín de la Asociación Boliviana de Ornitología	Asociación Boliviana de Ornitología	2021	Spanish, English	Open Access	Free

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TABLE 2. A decidedly incomplete list of examples of ongoing, Neotropical-based, long-term (20+ years) ornithology research programs (ordered by starting year), and the biological shortfalls they address. Domains follow Lees et al. (2020): Systematics, Biogeography, Population Biology, Evolution, Functional Ecology, Abiotic Tolerance, Biotic Interactions, Natural History; we add Human-wildlife Interactions as a ninth domain of critical importance to ornithology. *Data collection began in 1820 and was recently compiled.

Year started	Country or region	Biome	Focus	Domain	Example citation
1820*	Brazil	Atlantic Forest	Fragmentation	Biogeography	Hasui et al. (2018), Rodrigues et al. (2019)
1960s	Ecuador	Galapagos	Marine birds, endemics	Natural History, Population Biology, Human-wildlife Interac-	Jiménez-Uzcátegui et al. (2011, 2019), Dvorak et al. (2017)

				tions, Abiotic Tolerance, Biotic Interactions	
1970	Argentina	Espinal	Nests	Natural History	de la Peña (2005, 2019)
1970	Argentina	Marine	Marine birds	Population Biology, Abiotic Tolerance, Biogeography, Human-wildlife Interactions	Yorio et al. (2005), Copello and Quintana (2009)
1970	Mexico	Sea of Cortez	Seabirds	Population Biology	Anderson et al. (2017)
1980	Brazil	Amazon	Taxonomy, evolution	Systematics	Buainain et al. (2021), Ritter et al. (2021), Stopiglia et al. (2021)
1980	Mexico	Marine	Blue-footed Boobies	Evolution	Drummond et al. (1986), Pérez-Staples and Drummond (2005), Ancona et al. (2011, 2018)

1980	Mexico	Islands of the Sea of Cortez	Seabirds, Heermann's Gulls	Population Biology, Biogeography, Functional Ecology, Biotic Interactions	Velarde (1992), Velarde et al. (2015), Ruiz et al. (2017), Veit et al. (2021), Velarde et al. (2019)
1980s	Cuba	La Habana	Urban birds	Population Biology	García-Lau et al. (2018)
1989	Colombia	Bogotá	Urban and exurban	Monitoring	Stiles et al. (2017, 2021)
1990	Venezuela	Cordillera de la Costa Montane forest	Migrant and resident birds	Population Biology, Natural History	Lentino et al. (2003), Lentino (2016), Malpica-Piñeros et al. (2020)
1990	Venezuela	Caribbean	Parrot conservation	Population Biology, Human-wildlife Interactions	Sanz and Rodríguez-Ferraro (2006), Sánchez-Mercado et al. (2022)
1990	Brazil	Marine	Marine bird conservation	Human-wildlife Interactions	Váske Júnior (1991), Nascimento et al. (2022)

1991	Mexico	Gulf of Mexico Coastal Plain	Raptor monitoring and conservation	Population Biology	Ruelas Inzunza et al. (2000, 2009, 2010)
1991	Brazil	Atlantic Forest	Parrot conservation	Population Biology	Martinez and Prestes (2008, 2021)
1993–1994	Mexico	Pacific Islands	Socorro Dove, Socorro Mockingbird	Population Biology	Martínez-Gómez and Curry (1996), Martínez-Gómez et al. (2010)
1994	Paraguay	Atlantic Forest	Ethno-ornithology	Natural History, Human-wildlife Interactions	Chachugi (2013), Madroño (2016)
1994	Ecuador	Tropical Andes	Species-habitat associations	Population Biology, Biotic Interactions	Latta et al. (2011), Astudillo et al. (2020)
1995	Mexico	Tropical Dry Forest	Parrot conservation	Population Biology, Natural History, Biotic Interactions	Renton (2001), Renton and Salinas Melgoza (2004), Renton et al. (2018)

1995	Argentina	Chaco	Nests, behaviour	Natural History	Di Giacomo (2005)
1997	Chile	Mediterranean forest	Conservation biology	Natural History, Population Biology	Estades and Temple (1999), Santander et al. (2021)
1998	Argentina	Austral Temperate Forests	Magellanic Woodpecker	Population Biology	Ojeda (2004), Chazarreta et al. (2012)
1999	Argentina	Patagonian Monte	Burrowing Parrot	Population Biology	Masello and Quillfeldt (2012)
2000	Chile	Sub-Antarctic forest	Interdisciplinary ecology	Population Biology, Biotic Interactions, Human-wildlife Interactions	Rozzi and Jiménez (2014)
2002	Chile	South Temperate Rain Forest	Reproduction	Natural History	Moreno et al. (2007), Ippi et al. (2017), Botero-Delgadillo et al. (2020)

TABLE 3. Major barriers or systemic shortfalls that hold back the development of Neotropical ornithology.

Barrier	**Examples**
Funding	***Field work.*** Scarce and unpredictable funding from governments (including devaluation of currency) favors applied science; requires reliance on private sources (such as conservation grants); and strongly limits technology, geographic location, sample size, replication, and length of studies and monitoring programs. Researchers must constantly adapt their projects to available calls for funding, and develop many projects funded by several small grants in different areas, to sustain data collection. Often, Neotropical ornithologists don't study what they want to study the most, but instead adapt the resources they have to do what they can, making it difficult to maintain sampling protocols across time and space. ***Salaries and scholarships.*** Very small and unpredictable salaries of researchers and students make it difficult to spend personal funds on travel, conferences, courses, society memberships, computer hardware and software. Although scholarships are available for graduate students and post-docs in many countries (e.g., Brazil, Chile, Argentina, Mexico), nearly all come from a single source and are insuffi-

cient to allow any savings. Supervisors rarely have funding to pay short-term stipends, such that students from working class backgrounds may face poverty the month their fellowship ends. In practice, many ornithologists (e.g., in Argentina) can only access a paid teaching position at a university after years of unpaid work as a teaching assistant or junior lecturer.

Publication charges. Grant funding to Neotropical ornithologists is generally insufficient to pay for even one Open Access publication in a major journal, which typically costs >$1000 (~1–2 months' salary for a research scientist in Argentina). The Gold Open Access model, promoted by many governments and institutions as a best practice for sharing scientific knowledge, increases the impact of scientists from European and North American institutions (who can afford to pay), while effectively excluding knowledge produced by scientists in the Neotropics (who cannot). Valuable research remains as gray literature and unpublished theses because students must work at multiple, unrelated, often low-paying jobs while trying to publish thesis chapters.

Representation of Neotropical ornithologists

International priorities and decisions. A problematic view persists, of ornithologists from the Global South as a legion of 'fixers' and field workers. Southern collaborators regularly solve logistical problems and collect data, but their perspective is not valued in setting the research agenda or interpreting

and institutions in research leadership	results (Asase et al. 2021). Even northern researchers who firmly believe in their intent to respectfully collaborate with scientists from the Global South may act in opposite ways, for example by excluding southern partners from publications (Dahdouh-Guebas et al. 2003). Neotropical ornithologists are under-represented among the leadership of international ornithological societies, taxonomic authority bodies, editorial boards, scientific committees for conferences, and reviewers of global-scope journals, and are generally excluded from important policy decisions around research (e.g., data sharing, open access; Serwadda et al. 2018). Many researchers from the Global North begin working on Neotropical birds with very little understanding of the social, political, cultural, and ecological contexts of these birds; however, because of the tendency for top-down research and conservation agendas from the group with the funding, these researchers can control North-South "partnerships" in a semi-colonial fashion (Rodríguez et al. 2007, Boshoff 2009). International research proposals involving Neotropical birds, especially long-distance migrants to North America, frequently ignore or minimize critical Neotropical perspectives. The culture and values of academia push researchers (from North and South) to prioritize publishing as many papers as possible in high-impact journals, rather than translating and sharing study conclusions with local people and policy makers where the research was conducted.

Evaluation of research contributions. Evaluation rubrics within the Neotropics over-rely on academic metrics set by private, northern-based publishing companies, which has led to the prioritization of international agendas over regional needs (Monjeau et al. 2013) and become a major disincentive to natural history research, often discounted as 'descriptive' (Beehler 2010, Ríos-Saldaña et al. 2018). This continuous disincentive creates a vicious cycle that undermines the international impact of regional journals (Monjeau et al. 2013, Devenish-Nelson et al. 2017, Rau et al. 2017) as well as the training and retention of professional ornithologists in the Neotropics.

Inequalities among individuals. In most of our countries, access to scientific training is racially exclusionary and limited to economically privileged classes (Torres and Schugurensky 2002). In many countries (e.g., Bolivia) a career in science is likely to result in a marginal, unstable income, and is therefore not a viable option for most people. Pigmentocracy selects the racial groups that have access to higher education and financial resources, resulting in significant regional and racial bias to who produces scientific knowledge, and who continues to be sidelined, namely Black, Brown, and Indigenous Peoples. Political instability and economic uncertainty exclude minorities and minoritized groups from accessing higher education and scientific training. Moreover, throughout the Neotropics, ornithology is a field dominated by cis heterosexual males; women and members of the LGBTQIA+ community,

	especially trans people, have been vastly excluded due to misogyny and homophobia, which are pervasive in the region (Salerno et al. 2019).
	Inequalities among regions. In some countries (e.g., Argentina, Brazil, Chile, Colombia, Mexico), academic centers, scientists and projects have been concentrated in major cities, producing a bias in knowledge toward regions where natural habitats have been almost completely transformed. In others, (e.g., Ecuador), research is concentrated in specific geographic locations of interest to foreign scientists (Galapagos Islands, Amazonia) while the rest of the country remains generally neglected.
	Inequalities among countries. Whereas some countries have strong institutional research capacity (e.g., Mexico, Brazil), others suffer from a lack of ornithologists at universities, graduate programs that can host ornithological research, and employment opportunities for ornithologists across institutions and agencies (e.g., Dominican Republic). Institutional research capacity is cyclically under threat due to political shifts.
Restricted dissemination of	***Enforced language hegemony.*** The increased time, costs, and challenges to publish in English slow the advancement of knowledge and exclude many students in the Neotropics from making impactful contributions to science (Hanauer and Englander 2011, Ramírez-Castañeda 2020). Knowledge written

knowledge produced in the Neotropics

in languages other than English is much less likely to be cited (Di Bitetti and Ferreras 2017), creating unrealistic standards of English proficiency that are unfortunately enforced within our own countries (Monge-Nájera 2002), biasing the construction of knowledge (Konno et al. 2020) and excluding students from career-determining opportunities of scientific training and networking based on a skill strongly correlated with inherited socioeconomic status.

Citation bias towards the Global North. Citations and global reviews consistently overlook and under-represent knowledge produced by minoritized groups (Hofstra et al. 2020), including researchers in the Neotropics (Areta and Juhant 2019, MacGregor-Fors et al. 2020). We especially note this trend with respect to articles published in local or regional journals (often in Spanish or Portuguese; Di Bitetti and Ferreras 2017). Even authors from the Neotropics exhibit this citation bias, perhaps driven to select the most prominent references from Europe and North America, to frame their work in a context familiar to and respected by reviewers (Meneghini et al. 2008). Search engines like Google Scholar reinforce these biases by ranking articles by citation count, thereby burying less-cited papers that may be just as relevant (Matthew Effect, Beel and Gipp 2009).

Implicit bias. Authors with Neotropical affiliations face implicit bias during the submission process at high impact journals (Meneghini et al. 2008). Students and early-career researchers without a background in English face discrimination within Neotropical institutions. The names and family names of authors are often improperly or incompletely cited (e.g., the extended centuries-old tradition of most Latin American and Caribbean countries that uses a person's patronymic and matronymic hasn't been assimilated by most journals, resulting in a lower number of citations for these authors, Ruelas Inzunza 2009).

Logistical limitations	***Lack of government and institutional support.*** Although birds feature prominently in Neotropical cultures (Ibarra et al. 2013), they are generally undervalued in our increasingly urban communities, and ornithology is not a priority for Neotropical governments, even in countries with many ornithologists (e.g. Argentina and Brazil). Many initiatives (including conferences, journals, monitoring programs and records committees) lack institutional support, and instead depend on the commitment of individuals, so that they are difficult to sustain in the long term. Many countries in the Neotropics are currently in the hands of political leaders who defund academic institutions (Torres and Schugurensky 2002), dismantle environmental policies (Siqueira-Gay et al. 2020, Barbosa et al. 2021), and even persecute local scientists. In several countries in Latin America and the Caribbean, the COVID-19 pandemic has

had drastic negative effects on the training of the next generation of ornithologists, and many early career professionals are leaving the field due to economic uncertainty and lack of job security (Bottan et al. 2020, Dávalos et al. 2020, Ortega 2020).

Equipment and supplies. Many of the supplies and basic equipment taken for granted by northern researchers are unavailable in Neotropical countries and require complicated and expensive logistics to import legally, or time to make from scratch. For example, banders working in the Neotropics face a constant challenge in acquiring the numbered aluminium bands that are fundamental to any study capturing birds, and monitoring programs can be paused for years because bands are unavailable.

Permits. Permitting varies widely by country and jurisdiction, with some field research (e.g., in parts of Brazil) requiring permits from up to five organizations, each with its own requirements (e.g., an employee of the organization must accompany the researcher in the field, complicating the schedule). In some countries (e.g., Venezuela) obtaining permits has become virtually impossible for many projects. Permits are also required to import equipment, funds, and supplies to many areas, or to move samples for analysis, and can represent an insurmountable bureaucratic barrier.

Access and safety. In the second half of the 20th century, ornithologists and other scientists in many Neotropical countries suffered direct persecution (torture, imprisonment, exile) and massive interruptions to research programs during periods of socio-economic and political turmoil, including US-supported decades-long dictatorships (e.g., Fraga 2019). For many of us (ornithologists of the 21st century), this context framed our childhoods and/or early careers. Across many parts of the Neotropics, local ornithologists and allies are still attacked, kidnapped, and even murdered during fieldwork and bird conservation activities (Malakoff 2004, March Mifsut and Lazcano Barrero 2012, Palomino 2021, Méndez 2021).

TABLE 4. Examples of information about the reproductive biology of some Neotropical birds, published by 2017, which remained excluded from Birds of the World as of November 2021. The order of taxa follows Remsen et al. (2021).

Taxonomy	Published breeding information	Source
A. Example species without nest descriptions in Birds of the World		
Band-tailed Nightjar (*Systellura longirostris*)	Nest, eggs, nestlings	Balderrama et al. (2008)
Rothschild's Swift (*Cypseloides rothschildi*)	Nest, eggs	Dabbene (1918), Smyth (1928)
Slaty Gnateater (*Conopophaga ardesiaca*)	Nest, eggs	Sánchez and Aponte (2006)
Green Thorntail (*Discosura conversii*)	Nest architecture, egg	Sánchez et al. (2016)
Bearded Mountaineer (*Oreonympha nobilis*)	Nest, eggs	Córdoba-Córdoba et al. (2012)

Garden Emerald (*Chlorostilbon assimilis*)	Nest architecture, parental care	Sandoval and Escalante (2010)
Chestnut-headed Crake (*Anurolimnas castane-iceps*)	Nest, eggs	Buitrón Jurado et al. (2011)
Andean Motmot (*Momotus aequatorialis*)	Nest, eggs	Greeney et al. (2006)
Mottled Piculet (*Picumnus nebulosus*)	Nest, clutch, incubation and nestling periods, parental care, nestling growth	Pichorim (2006)
Grayish Piculet (*Picumnus granadensis*)	Nest, clutch, nest attentiveness, incubation bouts, nestlings	Sedano et al. (2008)
Versicolored Barbet (*Eubucco versicolor*)	Nest, parental care	Avalos and Mejía (2016)
Rusty-faced Parrot (*Hapalopsittaca amazonina*)	Courtship, nest placement, laying, incubation and nestling periods, parental care, fledging	Sanabria Mejía (2010)
Brown-breasted Parakeet (*Pyrrhura calliptera*)	Nest, laying, nestling growth	Arenas-Mosquera (2011)

Caatinga Antwren (*Radinopsyche sellowi*)	Nest construction, clutch, parental care	da Silva et al. (2008)
Band-tailed Antshrike (*Thamnophilus melanothorax*)	Nest	Zyskowski et al. (2008)
Spot-backed Antwren *(Herpsilochmus dorsimaculatus)*	Nest, fledgling	Melo and Xavier (2017)
Pectoral Antwren (*Herpsilochmus pectoralis*)	Nest, clutch	da Silva et al. (2008)
Leaden Antwren (*Myrmotherula assimilis*)	Nest, clutch	Leite et al. (2016)
White-lined Antbird (*Myrmoborus lophotes*)	Nest, clutch, parental care	Lebbin et al. (2007)
Stripe-headed Antpitta (*Grallaria andicolus*)	Nest architecture, placement, eggs, nestlings	Greeney (2012)
Speckle-breasted Antpitta (*Cryptopezus nattereri*)	Nest, clutch, parental care	Chachugi (2013), Bodrati and Di Sallo (2015)
White-browed Antpitta (*Hylopezus ochroleucus*)	Nest, nestlings, distraction display	Greeney et al. (2016)

Thicket Antpitta (*Myrmothera dives*)	Nest, nestlings, nestling diet	Greeney and Vargas-Jiménez (2017)
Trilling Tapaculo (*Scytalopus parvirostris*)	Nest, clutch, nestling growth rate, nest attentiveness	Smith and Londoño (2014)
Long-tailed Tapaculo (*Scytalopus micropterus*)	Nest, nestlings, nestling diet	Greeney and Gelis (2005)
Nariño Tapaculo (*Scytalopus vicinior*)	Nest, clutch, nestling	Arcos-Torres and Solano-Ugalde (2007)
Sharp-billed Treehunter (*Heliobletus contaminatus*)	Nest, clutch, nestlings, parental care	Cockle and Bodrati (2017)
Black-capped Foliage-gleaner (*Philydor atricapillus*)	Nest	Tanaka et al. (2016)
Ochre-breasted Foliage-gleaner *(Anabacerthia lichtensteini)*	Nest, nestlings, parental care	Saibene (1995), Cockle and Bodrati (2017)
White-browed Spinetail (*Hellmayrea gularis*)	Nest	Greeney and Zyskowski (2008)

Maquis Canastero (*Asthenes heterura*)	Nest, nest site	Martínez et al. (2011)
Serra do Mar Tyrant-Manakin (*Neopelma chrysolophum*)	Nest	Kirwan (2016)
Yungas Manakin (*Chiroxiphia boliviana*)	Nest, eggs, nestling growth, parental care	Hazlehurst and Londoño (2012)
Round-tailed Manakin (*Ceratopipra chloromeros*)	Nest, construction	Doucet and Mennill (2005)
Hooded Berryeater (*Carpornis cucullata*)	Nest architecture and placement (variation)	Mauricio (2013)
Fiery-throated Fruiteater (*Pipreola chlorolepidota*)	Nest construction, clutch, nestlings, nestling period	Gelis et al. (2006)
Black-capped Piprites (*Piprites pileata*)	Nest	Cockle et al. (2008)
Bronze-olive Pygmy-Tyrant (*Pseudotriccus pelzelni*)	Nest, clutch, nestlings, parental care	Greeney et al. (2005)

Rufous-headed Pygmy-Tyrant (*Pseudotriccus ruficeps*)	Laying, clutch, incubation period, nestlings	Greeney (2006)
Plain Tyrannulet (*Inezia inornata*)	Nest, eggs	Di Giacomo (2005)
Ash-breasted Tit-Tyrant (*Anairetes alpinus*)	Nest, eggs, nestlings, parental care	Barnes (2009), Greeney (2013)
Juan Fernandez Tit-Tyrant (*Anairetes fernandezianus*)	Nest, clutch, parental care	Hahn (2006)
Agile Tit-Tyrant (*Uromyias agilis*)	Nest, nestlings, adult behavior, ectoparasites	Bonier et al. (2008)
Rufous Mourner (*Rhytipterna holerythra*)	Nest construction, eggs	Snow et al. (2017)
Pale-edged Flycatcher (*Myiarchus cephalotes*)	Nest construction, clutch, incubation period, nestling period, nest attentiveness, nestling diet, fledgling period	Greeney and Dyrcz (2011)
White-rumped Monjita (*Xolmis velatus*)	Nest, eggs	Lombardi et al. (2010)

Salinas Monjita (*Neoxolmis salinarum*)	Nest, eggs, nestlings	Cobos and Miatello (2001)
Rufous-bellied Bush-Tyrant (*Myiotheretes fuscorufus*)	Nest, eggs, nestling growth, parental care	Kingwell and Londoño (2015)
Black-billed Peppershrike (*Cyclarhis nigrirostris*)	Nest architecture, eggs	Strewe (2001), David (2011)
Gray-mantled Wren (*Odontorchilus branickii*)	Nest placement, nest building	Johnson (2017)
Niceforo's Wren (*Thryophilus nicefori*)	Nest	Valderrama et al. (2007)
White-eared Solitaire (*Entomodestes leucotis*)	Nest	Rheindt and Quispe Vela (2008)
Hellmayr's Pipit (*Anthus hellmayri*)	Nest, eggs	Belton (1985), Güller et al. (2004), de la Peña (2005), Lombardi et al. (2010)
Carmiol’s Tanager (*Chlorothraupis carmioli*)	Nest, eggs, parental care	Martínez and Rechberger (2011)

Cinnamon-tailed Sparrow (*Peucaea sumichrasti*)	Nest, egg	McAndrews et al. (2008)
Plain-colored Seedeater (*Catamenia inornata*)	Nest, eggs	Peraza (2011)
Paramo Seedeater (*Catamenia homochroa*)	Nest, eggs	Chaparro-Herrera et al. (2015)
Masked Saltator (*Saltator cinctus*)	Nest, eggs, incubation period, nestling growth, nest attentiveness	Ortiz Mendoza (2013)
Multicolored Tanager (*Chlorochrysa nitidissima*)	Nest, clutch, nestling growth, parental care	Loaiza-Muñoz et al. (2017)

B. Example species with only a photo or very limited nest description in Birds of the World

Small-billed Tinamou (*Crypturellus parvirostris*)	Nesting period, nest, eggs, clutch size, incubation period, nest defense	Marini et al. (2012)

Picazuro Pigeon (*Patagioenas picazuro*)	Nesting period, nest, eggs, incubation period, nestling period	Marini et al. (2010)
Scissor-tailed Nightjar (*Hydropsalis torquata*)	Nestlings, parental care, apparent lack of territoriality, nesting ecology, nest defense	Pautasso and Cazenave (2002), Marini et al. (2012)
Pavonine Quetzal (*Pharomachrus pavoninus*)	Clutch, incubation, provisioning, nestling period, nestling diet, fledging	Lebbin (2007)
Buff-bellied Puffbird (*Notharchus swainsoni*)	Clutch, nestling period, parental care	Matthews and Smith (2017)
Ochre-collared Piculet (*Picumnus temminckii*)	Nest, clutch, incubation and nestling periods, nestlings, nest attentiveness, nestling diet, social roosting, parental care, evolution	Bodrati et al. (2015)
Chestnut-capped Foliage-gleaner (*Clibanornis rectirostris*)	Eggs, nestlings, pair fidelity, territoriality, parental care, nest success, fledgling movements	Faria et al. (2008)

Swallow-tailed Manakin (*Chiroxiphia caudata*)	Mating and social systems, incubation and nestling periods, daily nest survival, attentiveness during incubation and nestling periods, comparative life history	Brodt et al. (2014), Bobato (2016), Zima et al. (2017)
Three-wattled Bellbird (*Procnias tricarunculatus*)	Nest construction, courtship, copulation	Sánchez et al. (2013)
Suiriri Flycatcher (*Suiriri suiriri*)	Nesting ecology, nest survival, nestling development, *Philornis* parasitism, parental care, renesting	Lopes and Marini (2005a,b, 2006), Marini et al. (2012)
Chapada Flycatcher (*Guyramemua affine*)	Nesting ecology, nest survival, nestling development, *Philornis* parasitism, parental care, renesting	Lopes and Marini (2005a,b, 2006), França and Marini (2009, 2010)
Sulphur-rumped Flycatcher (*Myiobius barbatus*)	Nest, clutch, parental care	Greeney and Gelis (2007)
Gray-backed Tachuri (*Polystictus superciliaris*)	Clutch, incubation and nestling periods, nestling parasitism, parental care, daily nest survival, breeding synchrony, renesting	Hoffman and Rodrigues (2011)

Hudson's Black-Tyrant (*Knipolegus hudsoni*)	Nest materials, eggs	Lucero (2014)
Cipo Canastero (*Asthenes luizae*)	Nest characteristics, nesting behavior and ecology, brood parasitism, comparative life history/phylogeny	Costa (2011, 2015)
Red-billed Pied Tanager (*Lamprospiza melanoleuca*)	Nest, clutch, parental behavior	Melo and Xavier (2017)
Carmiol's Tanager (*Chlorothraupis carmioli*)	Clutch, nest attentiveness, incubation and nestling periods, incubation behavior, nestling growth, comparative life history/phylogeny	Valdez-Juarez and Londoño (2016)
Scrub Tanager (*Stilpnia vitriolina*)	Nest architecture, placement, clutch, eggs, nestlings, brooding behavior	Freile (2015)
Pale-throated Pampa-Finch (*Embernagra longicauda*)	Nest architecture, nest materials, nest site, clutch, eggs, nestlings	Freitas et al. (2009), Rodrigues et al. (2009)

TABLE 5. Recommendations to support the advancement of Neotropical Ornithology

Goal	Recommendations
Promote meaningful collaborations through new models of governance	1. Explicitly acknowledge the colonial legacy of ornithology in the Neotropics, including the historical exclusivity of field stations and expeditions embedded in systems of hierarchy and segregation (Raby 2017a,b). 2. Promote, sustain, and support the creation of ornithological societies in Neotropical countries in which there are none yet. 3. Create a consortium of ornithological societies in the Neotropics to foster regional collaboration and deliberate research priorities (e.g., priority-setting sessions of BirdsCaribbean). 4. Develop local evaluation methods (for scholarships, graduate programs, promotion, awards) that better reflect regional needs, reduce the use of academic metrics (e.g., journal impact factors), and include local impact evaluation (Rau et al. 2018, CLACSO 2020). 5. Promote shared visions and assumptions in ornithological organizations to effectively communicate regional bird research ideas to non-Neotropical institutions.

	6. Collaboratively develop systems for career-long mentoring, virtual meetings or guest visits among labs in different countries.
	7. Incentivize collective/shared leadership of research programs as a core principle of funding initiatives and academic recognition (Eichhorn et al. 2020).
	8. Prioritize South-South links to learn from and influence ideas across the Neotropics, Africa, and Asia (Cusicanqui 2012); to achieve this goal, organize special sections in meetings such as the International Ornithological Congress.
Promote diversity through justice, equity, and inclusion	9. Be intentional in eliminating all forms of racism in ornithology (see Schell et al. 2020, Ali et al. 2021, and Gosztyla et al. 2021, for actionable plans).
	10. Be intentional in strategies to promote the careers of Neotropical ornithologists across the spectrum of gender identities (Tulloch 2020).
	11. Address implicit bias and access considerations across all aspects of ornithology, including leadership of professional societies, editorial invitations, plenary and key-note speakers, and awards. Design award criteria to include Neotropical researchers, for instance, by prioritizing research on little-known study systems or regions.

	12. Facilitate international dissemination of results by removing barriers to Neotropical researchers (Table 3). For example, financial barriers can be reduced by eliminating article processing fees, and language barriers can be reduced through multilingual international meetings, such as the Neotropical Ornithological Congresses.
	13. Promote international visibility of locally produced knowledge by citing work in languages other than English. Machine learning has greatly improved the accuracy of free-of-charge translation platforms such as DeepL and GoogleTranslate. Thus, the language barrier is no longer an acceptable excuse for ignoring material published in languages other than English. Ensure that theory and examples from all regions and languages are included in the framing of papers.
Strengthen funding and professional development	14. Improve the impact of funding efforts. Short-term projects by visiting researchers may be able to help maintain a long-term project started by Neotropical residents. For example, we can better coordinate research efforts on long-distance migratory birds to leverage local research on residents and austral migrants that are currently understudied (Faaborg et al. 2010, Jahn et al. 2020) and undervalued in most research programs originating from Canada and the USA (e.g., migration monitoring, MoSI [Monitoreo de Sobrevivencia Invernal] stations, conservation of aerial insectivores).

15. Increase professional-track programs for ornithologists in training in the Neotropics. Provide funding and opportunities to maintain professional ornithologists in the Neotropics working in the field after completion of graduate studies and other professional training.

16. Work together towards increasing the implementation of funding programs to support visits to inspect museum specimens housed in collections in the Neotropics and in the Global North. A good example is the Frank M. Chapman Memorial Fund from the American Museum of Natural History: https://www.amnh.org/research/vertebrate-zoology/ornithology/grants.

17. Ornithologists in the Neotropics can provide professional and research mentorship to undergraduate and graduate students in the North, and vice-versa (McGill et al. 2021). Some examples are the "women and non-binary people of color in Ecology, Evolutionary Biology, and allied fields" https://wocineeb.wordpress.com/woc-in-eeb-networking, the EEB Mentor Match https://eebmentormatch.com, and Científico Latino https://www.cientificolatino.com.

18. Institutions can specifically address funding to marginalized groups; for example, the Graduate Course in Ecology at University of São Paulo (USP, Brazil) has recently opened a special call for students from social and ethnic groups that are disproportionately excluded. Fund research topics that are of greatest priority to marginalized groups (e.g., Hoppe et al. 2019).